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Assessment of nutritional status of female soccer players

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ABSTRACT

*The aim of the study was to assess and evaluate the nutritional status of female soccer players. The study was conducted on thirty inter-university level female soccer players from Sonipat district, Haryana. The age of the subjects ranged between 18 to 29 years. The objective of the study was to determine the body mass index (BMI) and nutritional status of female soccer players; and to compare the intake of macronutrients and micronutrients of the subjects with Recommended Dietary Allowances (RDA) values recommended by ICMR. The direct interview method was used to collect the primary data and assessment was made by using computerized nutritional analysis by software named "**dietcal 10.0 version**" 2016 by the (PROFOUND TECH SOLUTIONS). Daily energy intake was obtained from the subjects for three consecutive days. Comparison of nutrient intake with RDA values was made, and one sampled 't' test was applied to check the significance. The total energy intake of the subjects was found to be significantly lesser as compared to the RDA values. The findings of the present study indicated the inadequate total energy, carbohydrate and fibre intake of female soccer players. Fat and protein intake was greater than RDA values. Deficiency of some micronutrients was also observed in their diet.*

Keyword: - soccer players, macronutrients, micronutrients, RDA.

INTRODUCTION

Nowadays, soccer is the most popular sport in the World (Reilly et al. 2000). Children, adolescents, males and females participate at different levels in soccer all around the World. On a trained level, investigation says that the soccer players run an assessed distance of 10-12 kilometre inside the field at an average intensity of 80 to 90% of max heart rate, which in other terms could be designated as quite close to the anaerobic threshold. Skilled footballers control the ball against their opponent by skipping and other explosive movements such as running, tackling, changing speed, changing direction, and muscle contraction when traveling a distance of 10 kilometer during a match (Stolen et al. 2005). Being a football player requires many skills because the game is built on strategy, technical and physical performance. (Gil et al. 2007). It has been thoroughly examined by assuming that anthropometric parameters have an impact on the physical components of football performance (Bell and Rhodes,1975). The reported results provide evidence about the importance of anthropometry for sports officials (coaches, managers) as well as football players (American College of Sports Medicine, 2009).

Physical fitness and training depend on the nutritional status of sports personnel (Burke, 2001). Nutrition plays an important role in achieving a high level of achievement in sports and improving their health and fitness. (Fox, 1994; Nande, 2008). Nutrition not only plays a role in performance, but also can help preventing injuries, recovering from exercise, maintaining body weight, and developing overall health. As with all sports, a player must have good working knowledge of exercise science and an understanding of sports nutrition so that they can contribute to their own abilities (Loucks, 2004). There is a strong evidence that proper nutrient selection, intake time, and appropriate supplementation options are associated with optimal health and exercise performance. (Rodriguez et al. 2009). Based on scientific evidence, various dieticians have outlined some theories that should be observed by a soccer player for the positive effect of their diet on the performance. These include the last mealtime before the competition (2 - 3 hrs), a balanced diet consisting of 55 to 60% of the total energy added by carbohydrates, 25 to 30% by lipids and 10 to 15% by protein and sufficient energy intake (2033 - 4000 kcal). (MacLaren, 2003, Ruiz et al. 2005).

Macronutrients regularly focus on diet but micronutrients, vitamins and minerals are also an important feature of players' diet. When energy intake is sufficient, it is uncertain that micronutrient insufficiency will be existent, but in cases of low energy intake, as in case of some athletes, micronutrient insufficiency could be found (Papathakis and Pearson, 2012;

Supriya and Virginia, 2018). Vitamins are essential for the regulation of metabolic developments, synthesis of energy, accurate function of neurological processes and destruction of cells in the body. Minerals play a significant role in the building of tissues, an important element of enzymes and hormones; they also regulate metabolic and neural processes. (Purcell, 2013) Micronutrients are important in the repair of muscle tissues during recovery, which is particularly important for athletes. When vitamins and minerals intake is insufficient, the effectiveness of recovery be reduced and exercise capacity may also decrease, making the athlete less effective in exercise and sports situations. Although they often do not concentrate, vitamins and minerals can be changed very quickly in an athlete and therefore an overdose is sometimes required (Papathakis and Pearson, 2012; Supriya and Virginia, 2018). Some athletes, especially those involved in weight-loss activities or dietary restrictions, are less susceptible to energy consumption, vitamin and mineral loss in their diet can be found. It is advised that these types of players may benefit from daily multi-vitamin and mineral supplementation. In general, this benefit is not for performance, but also for the overall health in some severely deficient athletes. It was assumed that mineral supplementation might increase exercise capacity. The academy of nutrition and dietetics, American College of Sports Medicine (2009).

The present study was undertaken with the aim to assess the Body Mass Index (BMI), and nutritional status of female soccer players; and to compare the intake of macronutrients and micronutrients of the subjects with Recommended Dietary Allowances (RDA) values recommended by ICMR.

METHODOLOGY

The study was conducted on 30 females inter university level soccer players of Sonipat district, Haryana. The age of subjects ranged between 18 to 29 years. All subjects were informed of the purpose of the study and signed written informed consent.

Height and Body weight of the subjects were measured using Weighing Machine and Anthropometric Rod respectively.

The dietary intake was assessed for each subject by 24-hour dietary recall method for three consecutive days. A well-planned questionnaire containing all requisite queries was prepared. The dietary assessment was made by using computerized nutritional analysis by software named "dietcal 10.0 version" 2016 by the (PROFOUND TECH SOLUTIONS). The intake of

macronutrient and micronutrient of the subjects was compared with the Recommended Dietary Allowances (RDA) by ICMR (2010). To compare the data, t test was employed. The level of significance was set at 0.05 percent.

RESULTS

Table 1 represents descriptive statistics of the anthropometric parameters of soccer players. The mean age of female soccer players was 23.23 years, with a standard deviation of ±2.65. The mean height was observed to be 174.57 centimetres, with a standard deviation of ±6.46. The mean body weight was calculated to be 50.93 kg with a standard deviation of ±4.47. The mean BMI of female football players was calculated as 16.74 (kg/ m^2) with a standard deviation of ±1.54.

Table 1. Anthropometric characteristics of female soccer players.

Characteristics (n=30)	Mean+SD	MIN	MAX
Age (year)	23.23±2.65	18	29
Height (cm)	174.57±6.46	163	189
Body weight (kg)	50.93±4.47	40	62
BMI (kg/ m^2)	16.74±1.54	14.53	20.71

BMI- body mass index; MIN- minimum; MAX- maximum.

Table 2 represents the nutrients intake of female soccer players with reference to energy, carbohydrate, protein, fat, dietary fibres compared with the recommended dietary allowances (RDA) recommended by ICMR (2010), (Srilakshmi, 2014). It was found from the results that the average intake of energy (3079.92±889.41 kcal), carbohydrate (368.74±118.57) g/d, and dietary fibre (19.88±9.79 g/d) was lower than the RDA values. However, the average intake of protein, (112.77±36.39g/d), and fats (112.00±53.50g/d) of the subjects was found to be greater than the RDA values. The percentage of total energy intake from carbohydrate, protein and fat was observed to be 50.53%, 15.43% and 34.04% respectively. The total energy intake from fat was observed to be significantly more than RDA. between intake and RDA.

Table 2. Energy and macro nutrient intake of female soccer players and their comparison with RDA.

Macro-Nutrient	Intake (Mean±SD)	RDA	t -value	p-value	Significance
Energy (kcal)	3079.92±889.41	3600	-3.202	.003295	s
Carbohydrate (g/day)	368.74±118.57	585	-9.98	< .00001	s
Carbohydrate (g/kg bw/d)	7.33±2.55	8-10	-5.742	< .00001	s
Carbohydrate (% of total energy intake)	50.53±8.55	55-65	-9.267	< .00001	s
Protein (g/d)	112.77±36.39	82.5	4.555	.000087	s
Protein (g/kgbw/d)	2.24±0.77	1.0-1.5	5.241	.000013	s
Protein (% of total energy intake)	15.43±2.55	20-35	-20.535	< .00001	s
Fat (g/d)	112.00±53.50	30	8.395	< .00001	s
Fat (g/kgbw/d)	2.23±1.09	1.2-1.4	4.173	.000249	s
Fat (% of total energy intake)	34.04±9.67	15-30	2.288	.029594	s
Dietary fibre g/d	19.88±9.79	30	-5.465	< .00001	s

$p<0.05$; $p<0.01$; g/d- grams per day; g/kgbw/d- grams per kg body weight per day; s- Significant

Table 3. Represents the intake of micronutrients of female soccer players and their comparison with the recommended dietary allowances (RDA) recommended by ICMR.

The intake of Riboflavin (2.27±0.78 mgs), Total B6 (0.76±0.03 mgs), Vitamin A (744.07±545.46), Sodium (409.46±533.84), and Potassium (3330.72±1981.59) of the subjects was observed to be lesser than the RDA values. However, the intake of other micronutrients namely, Thiamine (6.40±3.07 mgs), Niacin (63.99±32.94 mgs), Folic Acid (288.53±141.71 µg), Vitamin B12 (3.17±9.18), Calcium (2010.10±724.51 mgs), Phosphorous (4665.07±1761.22 mgs), Iron (78.76±38.67 mgs), Vitamin C (202.43±358.11 mgs), and Magnesium (531.51±328.61 mgs) was found to be greater than the RDA values.

The difference between the intake and RDA values of Vitamin B12, Vitamin A and Potassium was found to be non-significant. Whereas, the difference between other micronutrients was noticed to be significant.

Table 3. Micro nutrient intake of female soccer player and compare with RDA.

Micro- Nutrient	Mean+SD	RDA	t- value	p- value	significance
Thiamine (mgs)	6.40±3.07	2.2	7.49	0.00001	s
Riboflavin (mgs)	2.27±0.78	3.1	-5.79	0.00001	s
Niacin (mgs)	63.99±32.94	18	7.65	0.00001	s
Total B6 (mgs)	0.76±0.03	2.4	-47.69	0.00001	s
Folic Acid (µg)	288.53±141.71	220	2.65	0.01294	s
Vitamin B12 (µg)	3.17±9.18	2.2	0.58	0.56893	n
Calcium (mgs)	2010.10±724.51	1000	7.64	0.00001	s
Phosphorous (mgs)	4665.07±1761.22	1000	11.40	0.00001	s
Iron (mgs)	78.76±38.67	29	7.05	0.00001	s
Vitamin A (µg)	744.07±545.46	840	-0.96	0.34339	n
Vitamin C (mgs)	202.43±358.11	65	2.10	0.04435	s
Magnesium (mgs)	531.51±328.61	370	2.69	0.01167	s
Sodium (mgs)	409.46±533.84	2000	-16.32	0.00001	s
Potassium (mgs)	3330.72±1981.59	3500	-0.47	0.64335	n

s- Significant; n- non-significant

DISCUSSION

The results of this nutritional analysis of female soccer players demonstrated an average daily intake, recorded over 3 days, to be 3079.92±889.41 kcal. This is lower than RDA values. Moreover, carbohydrate is the primary fuel substrate during playing football game, therefore, high dietary intake of 60- 70% of total calorie intake is recommended for athletes (Devlin and Williams, 1991). American College of Sports Medicine (ACSM) has recommended 6-10 grams of carbohydrate per day of body weight for athletes. In the present study, the average intake of carbohydrates was found to be 368.74±118.57 g/d, which is significantly below the RDA values ($p<0.05$). Current data provides more evidence to be generally observed low carbohydrate consumption that are deficient for adequate glycogen resynthesis in woman

players (Nutter, 1991; Tanaka et al. 1995). However, carbohydrate intake (50.53±8.55) in the present study in terms of percent of total energy intake was observed to be lesser than the range recommended by RDA (55-65%). However, if judged by Schokman et al. (1999) recommendations (7 to 10 g/kg/day), the carbohydrate intake of female soccer players in the present study was found to be 7.33±2.55 (g/kg/day), which seems to be sufficient. The low carbohydrate intake compared to RDA in terms of g/day of the subjects may be attributed to low total energy intake.

Soccer's endurance and strength requirements need improved dietary protein than their sedentary counterparts to support muscle protein synthesis and possibly act as an extra fuel supply (Lemon, 1994). In the present study, protein intake was noticed to be 112.77±36.39g/d (2.24±0.77 kcal/kg/day, when expressed in terms of relative body weight). Moreover, 15.43±2.55 percent of total energy intake was derived from protein. The Indian Council of Medical Research recommends a daily protein requirement of 0.8 g/kg body weight for Indian sedentary individual (Narasinga and Sivakumar, 2010). For endurance players and body builders, it can be up to 1.0 to 1.5 grams per kg body weight (Nutrition and Hydration Guidelines, 2007).

Fat requirements of players are similar; the amount of fat depends on the training status and aims of athletes (Potgieter, 2013). The fat intake of the players in the current investigation (112.00±53.50 g/d), when expressed to relative body weight (2.23±1.09 kcal/kg/day), was significantly greater than recommended dietary allowances. Moreover, 34.04±9.67 % of total energy intake was derived from lipids. Dietary intake of fat should not exceed 30% of total daily calorie intake. (Nutrition and Hydration Guidelines, 2007). Subjects of this study consumed excess amounts of fat, which may negatively affect training, nutrients density, and their ability to improve athletic performance. (Nutrition and Hydration Guidelines, 2007). As a result, while current fat intakes meet recommendations, these are towards higher end for sports performance. Players must be warned about the harmful effects of excessive consumption of fat. Vitamins and minerals are essential for metabolic functions as they act as cofactors for various enzymes involved in metabolism. The intake of micro nutrient thiamine was adequate in this study and Riboflavin was inadequate. It is generally evident that athletes with a low thiamine and riboflavin status have a reduced ability to do physical activity, especially performing maximal work. (Wardenaar et al. 2017). Niacin, Folic Acid and Vitamin B12 intake was greater than RDA values and Total B6 was lesser than RDA values. Energy intake insufficiency negatively reflects intake of vitamins and minerals (Wardenaar et al.

2017). Athletes should be encouraged to select foods rich in Vitamin-B such as fruits, vegetables, legumes, and milk to meet dietary requirements for specific vitamins. Intake of Calcium, Phosphorous, Iron, Vitamin C, and Magnesium was adequate in this study. However, Vitamin A, Sodium, Potassium was found to be inadequate. Previous research reported that Calcium, Vitamin D, Iron, and some antioxidants deficiencies are common among athletes (Wardenaar et al. 2017; Raizel el al, 2017).

Conclusion

The female soccer players of the present study were observed to consume insufficient energy, carbohydrate and dietary fibres. The female soccer players were found to be deficient in intake of Vitamin A, Vitamin B, Sodium and Potassium.

The results of the present study may contribute sports nutritionists, coaches and trainers to organise individualised nutrition education platforms, and dietary involvements for Indian football players to improve their performance and inform players about the harmful effects of consuming extra fat. In addition, athletes should be encouraged to select foods rich in Vitamins such as fruits, vegetables, pulses, and milk to meet nutritional requirements for specific vitamins.

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